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ABSTRACT

The etiological approach to psychological research is discussed, particularly regarding research on visual and vocal behavior. Thirty-four adult female dyads discussed topics on which they agreed and on which they disagreed. Each subject's looking and talking was recorded by observers on a computer in a time frame data structure. Data were analyzed by the program JOINT, which computed simple and transitional probabilities for the 16 mutually exclusive and exhaustive states of talking and looking. The four most common states are examined, along with transitions involving the remaining states that could represent floor changes between the speakers. Additional data analysis and research applications are suggested. (Author)

Sequential Analysis of Visual and Verbal Behavior During Dyadic Conversation

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Abstract

The etiological approach to psychological research is discussed, particularly regarding research on visual and vocal behavior. Thirty-four adult female dyads discussed topics on which they agreed and on which they disagreed. Each subject's looking and talking was recorded by observers on a computer in a time frame data structure. Data were analyzed by the program JOINT, which computed simple and transitional probabilities for the 16 mutually exclusive and exhaustive states of talking and looking. The four most common states are examined, along with transitions involving the remaining states that could represent floor changes between the speakers. Additional data analysis and research applications are suggested.

The recent threat of the cannabalization of psychology posed by that new hybrid discipline Sociobiology (Wilson, 1975) has caused psychologists to adapt the methods which biology claims have survival potential. Donald Campbell's Presidential Address (1975) speaks to this back-to-biology move by a discipline that seeks to be a fully scientific biological science rather than a quasi-scientific social science.

Methodologically, this change may be seen in the move away from manipulated and contrived laboratory experiments and toward the naturalistic observation of ethology. This essentially European tradition of watching animals in nature goes back through Lorenz's teacher Julian Huxley to Darwin and Malthus, and it brings to psychology an intellectual and scientific historical perspective that has been so noticeably lacking in most American psychology.

Among psychologists, it is those who study animals and young children who have found the most to recommend in this ethological approach. Since their subjects cannot complete questionnaires, fantasize on inkblots, or respond appropriately to other contrived measures devised by adult psychologists for adult subjects, investigators have been forced to watch just the normal behavior of their subjects in order to obtain data from them at all. But adults too can be observed and considered biologically just as any other animal.

In the present study, one of the most common adult activities, conversation, was recorded and analyzed. Visual and vocal behavior of a conversing dyad was examined for patterns and interrelationships. Visual

behavior, eye contact, or facial regard has been one of the most extensively studied of non-verbal behaviors. However, most of the research has used the relatively crude measure either of frequency or simple probability of the occurrence of facial regard. Stern (1974) has analyzed visual behavior more finely. He recorded on a continuous time base the exact visual regard of a mother-infant dyad and looked at the transitional probabilities that mutual gaze, mother only looking, infant only looking, or no looking will follow one another. Stern, Jaffe, Beebe, and Bennett (in press) have done the same with the vocal behavior of the same mother-infant dyads and have discovered several interesting patterns, especially dealing with the difference between co-vocalization and alternating vocalization. But these researchers did not analyze both the visual and vocal behaviors of the dyad together to determine their effect on each other. This more complex analysis is attempted in the present study. Interrelationships of visual and vocal behaviors were examined for adult dyads conversing on one topic on which they disagreed and one topic on which they agreed.

Method

Subjects were 34 unacquainted pairs of female college students. Each member of a pair answered a questionnaire giving opinions on 10 controversial topics at the beginning of the experimental session. The experimenter selected the topics on which each pair agreed most and disagreed most. Each pair discussed agreement and disagreement topics for 5 minutes each, with order of agreement-disagreement varied from pair to pair.

Looking was recorded by a pair of experimenters who observed the subjects through an observation mirror from an adjoining control room. The experimenters observed one subject of each pair directly and the other subject via a small mirror standing at the side of the pair. Experimenters recorded "eye contact" (facial regard) for each subject by holding down a button whenever that subject looked toward the face of the other. The depressed buttons signaled an IBM 1800 data acquisition computer which recorded the state of eye contact for each subject every half second. Talking was recorded on a stereo tape deck from microphones placed around the subjects' necks, using one channel for each subject. Following the session, the experimenter listened to the recording one channel at a time and depressed a button to signal the computer when each subject was talking. The four channels of information, A talks, A looks, B talks, and B looks, were merged to provide a second-by-second record of the talk-look state of each dyad during agreement and during disagreement.

Results

The time framed data records of verbal and visual behavior in half second frames were processed by the program JOINT (Bakeman, 1975), which gives the simple probabilities of the occurrence of the various behavioral states as well as the transitional probabilities that one state will follow another. Sixteen behavioral states are possible given the four behaviors recorded; thus, there are 16 simple probabilities and 256 transitional probabilities, because each of the 16 states can be followed by itself or any one of the 15 other states in the next time frame. The data were organized in a 16 x 16 matrix with the 16 simple probabilities placed above this matrix. Such a table was constructed for both the agreement and the disagreement conditions. With such a large matrix some differences will be significant by chance alone; what we looked for were significant differences which seemed plausibly to reflect the realities of conversation.

Examination of the simple probabilities of the 16 states showed that four states occurred between 15 and 20 percent of the time each, whereas the remaining 12 states occurred less than 7 percent each. The four most common states were (1) A looks, B talks but does not look, (2) A looks, B looks and talks (3) B looks, A talks but does not look, and (4) B looks, A looks and talks. The transitional probabilities revealed that the first two states followed each other frequently as did the last two. This can be seen in Figure 1. About 60 percent of the total time the listener looked while the speaker spoke, with the speaker sometimes looking at and sometimes looking away from the listener.

But how does the floor change between A talking and B talking? The two-state system of A talking seldom transitioned directly into the two-state

system of B talking. Four other states, however, did frequently transition into one each of the four main states, with much lower probabilities that the return transition should occur (see Figure). Examining these eight states - four main states, with a sort of contributory to each - it was discovered that by drawing in only the two most likely transitions going from each state a reciprocating chain of transitions was formed. When organized in this manner it appears that four states represent A holding the floor and four represent B holding the floor. The end or contributory states in Figure 1, though they usually transition back to the inside core states, also may transition to the opposite outside state of the other speaker's system. If this does happen the floor will very likely be changed, because the next transition will involve the other person talking.

For example, consider B talks and both look (#6) and then B talks and looks while A looks away (#5). Having lost his audience, B stops talking and only looks (#4). A begins talking while looking away as B continues to look (#3). Finally A talks and looks back at B who continues to look (#2). From the transitions it can be seen that once B stops talking and is the only one looking (#5 to #4), it is much more likely that A will take the floor (#4 to #3) than B reclaim it (#4 to #5).

Also of interest are the differences between the transitions from #1 to #2 and from #5 to #6 during agreement and disagreement. These two transitions are essentially the same - the listener looks back at the speaker after he has been looking away. These transitions appear to be significantly higher for disagreement than for agreement, indicating a quicker return of visual attention by the listener during disagreement than during agreement, which seems plausible. There is a momentum in disagreement that keeps the speaker going even when his audience looks away. Other differences between agreement and disagreement in transitions were discovered

and will be examined for statistical significance and studied for meaningful patterns. Needless to say, there is far more data to be analyzed than can be presented here.

Discussion

This particular data analysis is but one of many possibilities. Any analysis depends on the interests and interpretations of the researcher, and this is especially true given 272 dependent variables (transitional probabilities per condition. The possibilities become more staggering if we consider patterns among 272 variables or transitional probabilities higher than first order ones.

We have pointed to probable transitions of the floor between speakers, but such floor changes can be identified with certainty only by examining higher order transitional probabilities - for example, the probability of a two-step transition from State A to State B to State C. Only by identifying such chains could we tell if, for example, a transition state leads to a change of floor or a return to the original speaker following a pause or interjection. Higher order transitional probabilities can also reveal chains of behaviors and tell us if behavioral patterns represent orderly sequences or more random and casual ones. The uncertainty of an interaction, with a high uncertainty indicating less rigid order of events (higher entropy) can be computed for different experimental conditions.

One advance made in the present analysis is the examination of the visual and vocal behaviors together. True, the numbers generated are many and their interrelationships complex, but social interaction itself is complex. To add a third behavior, such as smiling, would generate a 64 x 64 matrix with 4096 transitional probabilities, but if the 64 states can be recoded in fewer categories we might further understand the characteristics of dyadic interchange. At present we hope to become familiar with the intracacies of

a two-behavior matrix before moving on to greater complexities.

Data acquisition technology, be it computer, Datamyte recording device, or any other real time event recorder, will be important for any ethological observation in the future. Likewise, the data structure of coded categorical behaviors recorded in a time frame format and the data analysis of simple and transitional probabilities seem basic to such research. Given this technology and statistical methodology various kinds of interactions can be analyzed.

For example therapist-client conversations could be so analyzed to give the therapist a more objective source of information than projective techniques or clinical impressions. Everyday interactions between friends or strangers, or strangers getting to know one another over several meetings, might be studied to tell us more about the development of human relationships. Sex differences in interactive styles could be examined as well. Whatever the final application, more analysis now of the real social behavior of conversing adults, one of our most common and significant activities, can only further our understanding of human behavior.

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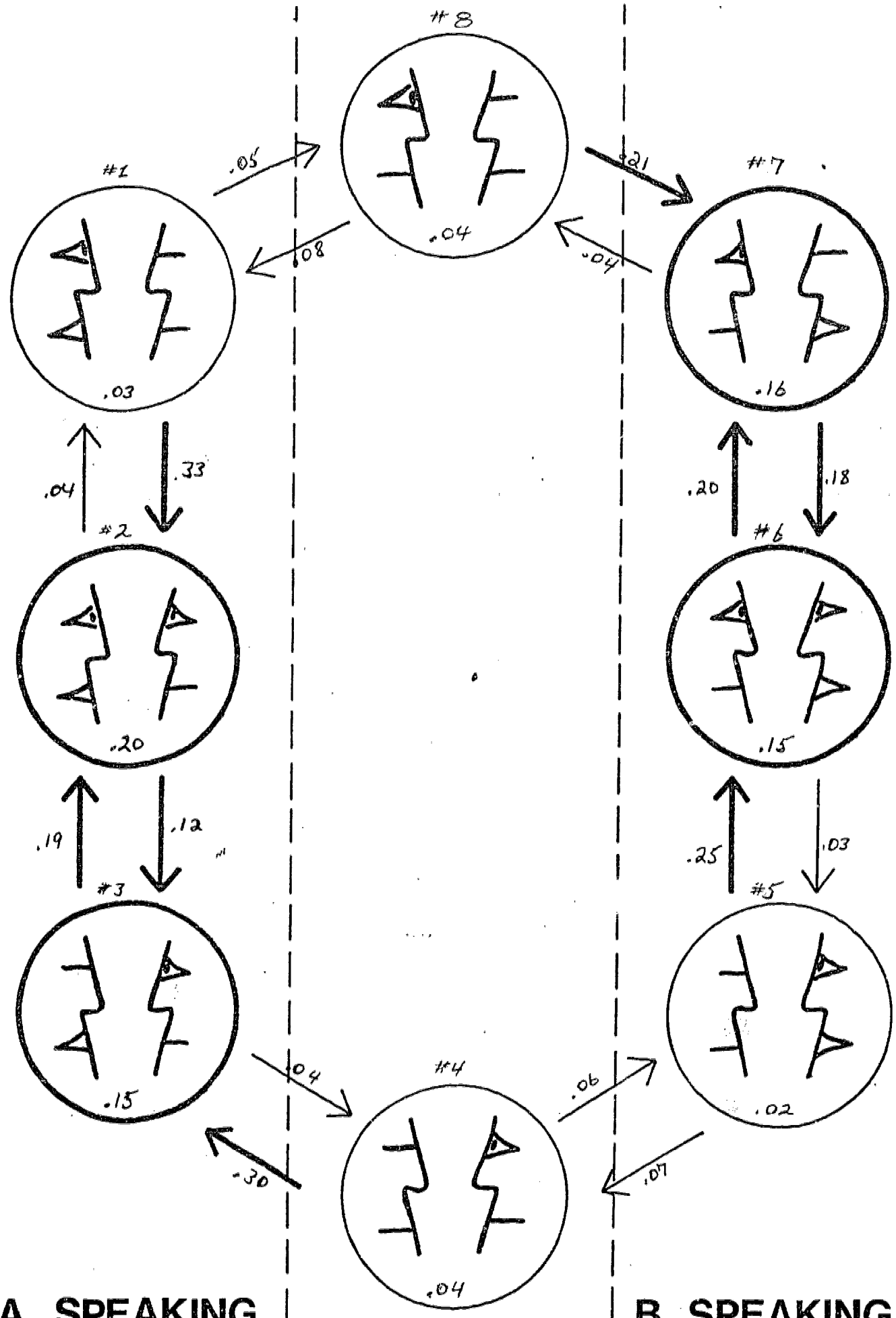

A SPEAKING

B SPEAKING